CLAIMS:

1. A method of calibrating a transmitting part of a node in a wireless communication network, which communication network comprises at least a first radio node and a second radio node which can be arranged to be in radio communication with each other, and wherein at least one radio node receives radio signals from multiple antennas, said calibration method comprises the steps of

-*transmitting* (605,705) first pilots signals both from the first radio node to the second radio node and from the second radio node to the first radio node;

-*determining* (610, 710) in the second radio node a first estimate of the channel characteristics from the first radio node to the second radio node, and in the first radio node determining a second estimate of the channel characteristics from the second radio node to the first radio node, said determining based on respective received first pilot signals;

-*calculating* at least one *channel correction factor* in the first radio node based on the first and second channel estimates,

the calibration method **characterised by** the steps of:

-*transmitting* (611, 711-712) a modified second pilot signal from the first radio node to the second radio node, said modification based on the second channel estimate;

-*estimating* transmission errors (612, 713) in the second radio node, said estimation based on the first channel estimate and the received second pilot signal and calculating a correction vector with correction terms for each of the multiple antennas based on the transmission errors;

-*exchanging* (615, 715) the correction vector from the second radio node to the first radio node; and

in that the step of calculating correction factors (620,720) comprises calculating one correction factor for each antenna, the correction factors are based at least partly on the respective correction terms in the correction vector, said correction factors adapted for use in transmissions from the first radio node to the second radio node.

2. Calibration method according to claim 1, **wherein** the calibration method is initiated in predetermine time intervals.

3. Calibration method according to claim 1, **wherein** the calibration method is initiated as a response of a measure of communication quality being below a predetermined threshold value.

4. Calibration method according to any of claims 1 to 3, **wherein** the modification of the second pilot signal comprises a multiplication of a pilot signal with the complex conjugate of the second channel estimate.

5. Calibration method according to any of claims 1 to 4, **wherein** the correction vector is exchanged in the form of a compact representation of the correction vector.

6. Calibration method according to any of claims 1 to 5, **wherein** the first radio node (A) is provided with $n_A$ antennas and the second radio node (B) is provided with $n_B$ antennas and wherein at least the first radio node has at least two antennas, wherein
-in the first transmitting step (605) the first pilot signals, $P_c$, are column vectors;
-in the determining step (610) a first estimate, $\hat{H}_{A\to B}$, of the channel characteristics from the first radio node to the second radio node is calculated in the second radio node, and a second channel estimate $\hat{H}_{B\to A}$ of the channel characteristics from the second radio node to the first radio node is calculated in the first radio node;
-in the second transmitting step (611) the second pilot, $P_s$, is pre-multiplied according to:

$$P_s \cdot H^{*}_{B\to A} \cdot \mathbf{1}_{n_B},$$

which at the second radio node will be received as $R_s$, and wherein $H^{*}_{B\to A}$ is the complex conjugate of the second channel estimate, $P_s$ is an $n_A \times n_A$ diagonal matrix containing $n_A$ individual pilot signals and $\mathbf{1}_{n_B}$ is an all-one column vector of dimension $n_B$;
-in the estimating step (612) the correction vector is calculated based on $R_s$ and $H_{A\to B}$, and comprises error corrections terms for each of the first radio node's antennas; and
-in the calculating step (620) channel correction factors for each antenna are calculated based on the correction vector.

7. Calibration method according to any of claims 1 to 5, **wherein** the first radio node (A) is provided with $n_A$ antennas and the second radio node (B) is provided with $n_B$ antennas and wherein at least the first radio node has at least two antennas, wherein the radio communication is based on Singular Value Decomposition (SVD), and
-in the first transmitting step (705) the first pilot signals, $P_c$, are column vectors;
-in the determining step (610) a first estimate, $\hat{H}_{A\to B}$, of the channel characteristics from the first radio node to the second radio node is calculated in the second radio node, and a second channel estimate $\hat{H}_{B\to A}$ of the channel characteristics from the

second radio node to the first radio node is calculated in the first radio node;
-in the second transmitting step (611) the second pilot, $P_d$, is pre-multiplied with a pre-filter, $H^*_{B\to A}$, which is the complex conjugate of the second channel estimate, which as the second radio node will be received as

$$R_s = H_{A\to B} \cdot H^*_{B\to A} \cdot P_d;$$

-in the estimating step (713) the correction vector is calculated in the second node and based on $H^*_{B\to A}$ and $H_{A\to B}$, wherein $H_{A\to B}$ is estimated from the first pilot signal and $H^*_{B\to A}$ is estimated from $R_s$; and

-in the calculating step (720) channel correction factors for each antenna are calculated based on the correction vector.

8. Calibration method according to any of claims 1 to 7, **wherein** the correction vector comprises representation of either delay-errors, phase-errors or amplitude-errors, or a combination of these errors.

9. Calibration method according to any of claims 1 to 8, **wherein** a first part of the step of transmitting channel estimation symbols is performed in a first transmit time slot $TX_1$, wherein the second radio node transmit a pilot, $P_C$, which is received by the first radio node, which is in a receive mode; and
a second part of the step of transmitting channel estimation symbols is performed in a second transmit time slot $TX_2$, wherein the first radio node transmit a pilot, $P_C$, $P_d$ or $P_S$ which is received by the second radio node, which is in a receive mode.

10. Calibration method according to claim 9, **wherein** the step of exchanging information between radio nodes is performed in a third transmit timeslot $TX_3$, wherein the second radio node is in regular transmit mode and transmits information on the radio channel to the first radio node, which is in receive mode.

11. Calibration method according to claim 10, **wherein** the first radio node estimates the radio channel from the second radio channel to the first radio node, $H_{B\to A}$, in the first transmit time slot $TX_1$.

12. Calibration method according to claim 10 or 11, **wherein** the second radio node estimates the radio channel from the first radio channel to the second radio node, $H_{A\to B}$ in the second transmit time slot $TX_2$.

13. Calibration method according to claim 12, **wherein** the second radio node further estimates a correction vector or correction term in the second transmit time slot $TX_2$.

14. Calibration method according to any of claims 10 to 13, **wherein** the step of calculating correction factor or factors in the first radio node is performed in the third transmit timeslot $TX_3$.

15. A communication system (800) for wireless communication, the system comprising at least a first radio node and a second radio node which can be arranged to be in radio communication with each other, said communication system **characterised in** that the at least the first radio node is calibrated with the aid of the second radio node by the use of the calibration method according to any of claims 1 to 14.

16. The communication system according to claim 15, **wherein** the at least one of the radio nodes of the system utilizes a multiantenna configuration as adapted for MIMO- based communication.

17. A radio node adapted for wireless communication in a wireless network (800), which network comprises at least one further radio node, the radio node comprises:
-an exchanging module (232) adapted for receiving at least one first radio channel estimate from at least the further radio node;
-a channel estimating module (224) adapted for producing a second radio channel estimate from a radio signal received by the radio node;
-a calculating module (226) adapted for calculating a correction vector/term or a representation of a radio channel estimates based on the received first radio channel estimate and the second radio channel estimate; and
-a compensating module (234) for compensating radio transmissions from the radio node with at least one correction factor which is at least partly based on the calculated calibration,
and is **characterised by**:
-a pilot transmitting module (228) adapted for controlling the transmission of first pilot signal and a second pilot signal, wherein the second pilot signal is modified with the second radio channel estimate.

18. The radio node according to claim 17, **wherein** the radio node further comprises means for initiating a calibration process, said initiating means adapted to initiate the calibration process in predetermine time intervals.

19. The radio node according to claim 17, **wherein** the radio node further comprises means for initiating a calibration process, said initiating means adapted to initiate the calibration process as a response of a measure of communication quality being below a predetermined threshold value.

20. The radio node according to any of claims 17 to 19, **wherein** the radio node utilizes a multiantenna configuration.

21. The radio node according to any of claims 17 to 20, **wherein** the radio node is a mobile station (815).

22. The radio node according to any of claims 17 to 20, **wherein** the radio node is a radio base station (805).

23. The radio node according to any of claims 17 to 20, **wherein** the radio node is a relay station (810).